

What is claimed is:

1. A conversion integrated circuit (IC) for RF signals, comprising;
  - a first interface for transmitting or receiving a first number of distinct
  - 5 RF frequency bands in a broadband spectrum;
  - a plurality of circuit elements coupled to the first interface, one for each of the frequency bands, for up-conversion or down-conversion of the frequency bands to and from an intermediate frequency (IF);
  - a second interface coupled to said circuit elements for receiving and
  - 10 transmitting at the intermediate frequency (IF); and
  - a second number of on-chip voltage-controlled oscillators (VCOs) coupled to the circuit elements for generating local-oscillator (LO) signals to the circuit elements for conversion between the IF frequency and the receive or transmit frequency for each band;
  - 15 characterized in that the second number is smaller than the first number.
2. The IC of claim 1 wherein one of the on-chip VCOs, through alternative sideband selection, provides the LO frequency for two or more of the RF
- 20 frequency bands in the broadband spectrum.
3. The IC of claim 1 further comprising frequency doubling circuitry coupled to one of the VCOs, such that the coupled one of the VCOs provides a different frequency to each of two of the sideband selection
- 25 circuit elements.
4. The IC of claim 1 further comprising frequency doubling circuitry coupled to one of the VCOs, such that the VCO, through frequency

doubling and/or redoubling, and through alternative sideband selection, provides the LO frequency for up-conversion or down-conversion of three or more of the RF frequency bands in the broadband spectrum.

5        5. The IC of claim 1 dedicated to down-conversion of the RF frequency bands.

6. The IC of claim 1 dedicated to up-conversion of the RF frequency bands.

10       7. The IC of claim 1 having circuit elements for both up-conversion and down-conversion.

8. A broadband receiving/transmitting system, comprising:

15       an antenna for receiving or transmitting RF signals in a broadband spectrum including a first number of signal bands;

         a conversion integrated circuit (IC) coupled to the first number of signal bands by a first interface of the IC; and

20       modulation circuitry coupled to the IC by a second interface of the IC for receiving or transmitting each of the bands at a common intermediate frequency (IF);

         characterized in that the conversion IC comprises a plurality of circuit elements coupled to the first interface, one for each of the frequency bands, for up-conversion or down-conversion of the frequency bands to and from an intermediate frequency (IF), and a second number of on-chip  
25       voltage-controlled oscillators (VCOs) coupled to the circuit elements for generating local-oscillator (LO) signals to the circuit elements for conversion between the IF frequency and the receive or transmit frequency for each band, the second number less than the first number.

9. The system of claim 8 wherein one of the on-chip VCOs, through alternative sideband selection, provides the LO frequency for two or more of the RF frequency bands in the broadband spectrum.

5

10. The system of claim 8 further comprising frequency doubling circuitry coupled to one of the VCOs, such that the VCO provides a different frequency to each of two of the sideband selection circuit elements.

10

11. The system of claim 8 further comprising frequency doubling circuitry coupled to one of the VCOs, such that the VCO, through frequency doubling and/or redoubling, and through alternative sideband selection, provides the LO frequency for up-conversion or down-conversion for three or more of the RF frequency bands.

15

12. The system of claim 8 dedicated to down-conversion of the RF frequency bands.

13. The system of claim 8 dedicated to up-conversion of the RF frequency bands.

20

14. The system of claim 8 having circuit elements for both up-conversion and down-conversion.

25

15. A method for providing local oscillator (LO) signals to a first number of sideband-selection circuit elements in up-conversion or down-conversion circuitry, for a broadband spectrum including the first number of frequency bands, comprising the steps of:

(a) providing a second number of on-chip voltage-controlled oscillators (VCOs), the second number fewer than the first number; and

(b) serving all of the circuit elements with appropriate LO frequencies by one or both of alternative sideband selection and frequency doubling techniques.

16. The method of claim 15 wherein, in step (b), one of the on-chip VCOs, through alternative sideband selection, provides the LO frequency for two or more of the RF frequency bands in the broadband spectrum.

17. The method of claim 15 wherein frequency doubling circuitry coupled to one of the VCOs provides a different frequency to each of two of the sideband selection circuit elements, the provided VCO frequency being doubled for one of the circuit elements, and doubled again for another.

18. The method of claim 15 wherein frequency doubling circuitry coupled to one of the VCOs, such that the VCO, through frequency doubling and/or redoubling, and through alternative sideband selection, provides the LO frequency for up-conversion or down-conversion to three or more of the RF frequency bands.

19. The method of claim 15 dedicated to down-conversion of the RF frequency bands.

20. The method of claim 15 dedicated to up-conversion of the RF frequency bands.

